

What is claimed is:

- 1 1. A survivor path decoding apparatus for a Viterbi
2 decoder with a constraint length of K , comprising:
3 a best survivor unit for receiving path metrics of 2^{K-2}
4 local winner states from which a best state is
5 selected every L iterations, wherein said local
6 winner states are chosen from 2^{K-2} pairs of odd
7 and even states, respectively; and
8 a survivor memory comprising:
9 a register-exchange network for receiving
10 decision bits of 2^{K-1} states and generating
11 decision vectors of survivor paths leading
12 to said 2^{K-1} states at instant i according to
13 said decision bits of said 2^{K-1} states from
14 instant $i-L$ to instant i , wherein said 2^{K-1}
15 states are divided into said 2^{K-2} pairs of
16 odd and even states, said decision vectors
17 of said 2^{K-1} states are output every L
18 iterations, and each of said decision
19 vectors has a length of L bits and; and
20 a trace-back unit for storing said decision
21 vectors of said 2^{K-1} states and finding a
22 global survivor path sequence by following
23 said decision vectors back from the best
24 state at instant $i-L$, such that L decoded
25 bits are output every L iterations.
- 1 2. The apparatus as recited in claim 1 wherein said
2 best survivor unit comprises γ 2-to-1 comparators for

3 choosing the best state among said 2^{K-2} local winner states
4 by comparing said path metrics of said 2^{K-2} local winner
5 states in $L-1$ iterations.

1 3. The apparatus as recited in claim 2 wherein the
2 number of said 2-to-1 comparators, γ , is given by:

3
$$\gamma = \left\lceil \frac{2^{K-2} - 1}{L - 1} \right\rceil$$

4 where $\lceil \cdot \rceil$ denotes a ceiling function.

1 4. The apparatus as recited in claim 1 wherein said
2 number of L is equal to a divisible factor of a data payload
3 length for a conformant 802.11g system.

1 5. The apparatus as recited in claim 4 wherein said
2 number of L is equal to 8 for said conformant 802.11g
3 system.

1 6. The apparatus as recited in claim 1 wherein said
2 survivor memory features a decoding window length of
3 $\Gamma = L(L-2) + K - 1$.

1 7. A rate $1/n$ Viterbi decoder with a constraint length
2 of K comprising:

3 a branch metric generator for computing a plurality of
4 branch metrics, each of which is a distance
5 between a corresponding branch label and a
6 currently received data symbol including n
7 decision metrics;

8 an add-compare-select module, responsive to said branch
9 metrics, for generating decision bits of 2^{K-1}
10 states along with path metrics of 2^{K-2} local

11 winner states, wherein said 2^{K-2} local winner
12 states are selected from 2^{K-2} pairs of odd and
13 even states, respectively, and said 2^{K-1} states
14 are divided into said 2^{K-2} pairs of odd and even
15 states;
16 a best survivor unit for receiving said path metrics of
17 said 2^{K-2} local winner states from said add-
18 compare-select module and selecting a best state
19 from among said 2^{K-2} local winner states every L
20 iterations; and
21 a survivor memory comprising:
22 a register-exchange network for receiving said
23 decision bits of said 2^{K-1} states from said
24 add-compare-select module and generating
25 decision vectors of survivor paths leading
26 to said 2^{K-1} states at instant i according to
27 said decision bits of said 2^{K-1} states from
28 instant $i-L$ to instant i , wherein said
29 decision vectors of said 2^{K-1} states are
30 output every L iterations and each of said
31 decision vectors has a length of L bits; and
32 a trace-back unit for storing said decision
33 vectors of said 2^{K-1} states and finding a
34 global survivor path sequence by following
35 said decision vectors back from the best
36 state at instant $i-L$, such that L decoded
37 bits are output every L iterations.

1 8. The Viterbi decoder as recited in claim 7 wherein
2 said best survivor unit comprises γ 2-to-1 comparators for

Client's ref.: P49US

Our ref.: 0751-10313US/final/M.F.Lin/Kevin

3 choosing the best state among said 2^{K-2} local winner states
4 by comparing said path metrics of said 2^{K-2} local winner
5 states in $L-1$ iterations.

1 9. The Viterbi decoder as recited in claim 8 wherein
2 the number of said 2-to-1 comparators, γ , is given by:

3
$$\gamma = \left\lceil \frac{2^{K-2} - 1}{L - 1} \right\rceil$$

4 where $\lceil \cdot \rceil$ denotes a ceiling function.

1 10. The Viterbi decoder as recited in claim 7 wherein
2 said number of L is equal to a divisible factor of a data
3 payload length for a conformant 802.11g system.

1 11. The Viterbi decoder as recited in claim 10 wherein
2 said number of L is equal to 8 for said conformant 802.11g
3 system.

1 12. The Viterbi decoder as recited in claim 7 wherein
2 said survivor memory features a decoding window length of
3 $\Gamma = L(L-2) + K - 1$.

1 13. The Viterbi decoder as recited in claim 7 wherein
2 said decision metrics are hard-decision data if quantized to
3 one-bit precision.

1 14. The Viterbi decoder as recited in claim 7 wherein
2 said decision metrics are soft-decision data if quantized
3 with more than one bit of precision.